Application of absorbing boundary condition to few-body cluster dynamics

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Dynamics induced by reactions of few-body nuclear systems, such as binary or three-body clusters, gives an important impacts on research field about nuclear astrophysics. For example, a resonance formation induced by the collision of two cluster systems and a dissociation of a nucleus into binary fragments are typical examples of dynamical process, which are essential in the analysis of nuclear astrophysics.

The so-called absorbing boundary condition (ABC) method (or complex absorbing method (CAP))[1,2] is one of effective tools to handle the few-body dynamics in unbound continuum states as well as the complex scaling method (CSM) [3]. In the ABC method, the negative (absorptive) potential is placed outside of the total system to absorb the continuum component of the scattering wave function. Since the asymptotic amplitude of the wave function is smoothly damped under the absorbing boundary condition, the unbound continuum states can be treated in the similar manner to the bound state problem.

We have advanced the application of the ABC method to various few-body cluster systems. In the present report, I will explain the basic aspects about the ABC method and show the several applications to the dynamical reaction in the binary cluster systems. Furthermore, I will discuss the extension of the ABC method to the three-body cluster system, in which the coordinate rearrangement is explicitly taken into account.

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[3] S. Aoyama, T. Myo, K. Katō, and K. Ikeda, Prog. Theor. Phys. **116**, 1 (2006).